ISSN 0306–0667

UNIVERSITY OF EDINBURGH

EDINBURGH REGIONAL COMPUTING CENTRE

Eleventh Annual Report

EDINBURGH REGIONAL COMPUTING CENTRE

Eleventh Annual Report

1 August 1977 to 31 July 1978

CONTENTS

MEMBERSHIP OF EDINBURGH COMPUTING COMMITTEE

Nominees of the Educational Policy Committee	Professor E.A.V. Ebsworth, (Convener), Sc.D.,M.A.,Ph.D.,F.R.I.C.,F.R.S.E. Mrs M.M. Barritt, F.B.C.S. Professor F.H. McClintock, B.Sc.,M.A.,Hon.LL.D.
The Director Edinburgh Regional Computing Centre	Dr G.E. Thomas, B.Sc.,M.Sc.,Ph.D.,M.I.E.E.
The Deputy Director (Local Systems)	Dr J.G. Burns, B.Sc.,Ph.D.
Representatives of the Research Councils	Dr J.M.M. Cunningham, B.Sc.(Agric.),Ph.D.,F.R.S.E.,F.I.Biol. Mr S. Lawrie
Representatives of the Users' Committee	Dr M.A.D. Fluendy, M.A.,D.Phil.,C.Chem.,F.R.I.C.,M.Inst.P. Mr A.F. Purser, B.Sc.,A.R.C.S. Mr J. Tansley, B.Sc.
Representatives of the Faculty of Science	Dr I.F. Christie, B.Sc.,Ph.D.,F.I.C.E.,F.I.P.H.E.,M.I.W.E. Dr J. Muir, B.Sc.,Ph.D.
Representative of the Faculty of Medicine	Professor J.R. Greening, Ph.D.,D.Sc.,F.Inst.P.,F.R.S.E.
Representative of the Faculty of Social Sciences	Dr M. Andreson, M.A., Ph.D.
The Professor of Computer Science	Professor S. Michaelson, B.Sc.,A.R.C.S.,F.R.S.E.,F.I.M.A.
Secretary to the Committee	Dr Y. Nadeau, M.A.Ph.D.

REGIONAL COMPUTING ORGANISATION
MANAGEMENT OF THE MANAGEMENT COMMITTEE

University of Edinburgh	Professor E.A.V. Ebsworth, (Convener), Sc.D.,M.A.,Ph.D.,F.R.I.C.,F.R.S.E. Professor S. Michaelson, B.Sc.,A.R.C.S.,F.I.M.A.,F.R.S.E. Dr J. Muir, B.Sc.,Ph.D.
University of Glasgow	Professor A.M. Potter, M.A.,Ph.D. Professor J. Lamb, D.Sc.,Ph.D. Mr J.M. Black, B.A.
University of Strathclyde	Professor A.M. Rosie, B.Sc.,M.Sc.,Ph.D.,F.I.E.E.,M.I.E.E. Professor D.S. Butler, M.A.,F.I.M.A. Dr D.E. Kidd, B.Sc.,Ph.D.
Research Councils	Dr J.M.M. Cunningham, B.Sc.(Agric.),Ph.D.,F.I.Biol.,F.R.S.E.
Director	Dr G.E. Thomas, B.Sc.,M.Sc.,Ph.D.,M.I.E.E.,F.R.S.E.
Secretary	Mrs D.M. Baker, M.A.

Senior Staff of the Edinburgh Regional Computing Centre
(As as 31 July 1978)

Director	G.E. Thomas, B.Sc.,M.Sc.,Ph.D.,M.I.E.E.,F.R.S.E.
Deputy Directors	J.G. Burns, B.Sc.,Ph.D. P.E. Williams, B.Sc.
Administrative Officer	D.B. Marshall, T.D.,M.A.,B.Com.
Principal Computing Officers	W. Aitken, B.Sc. F.E.J. Barratt R.E. Day, B.Sc. A. Gibbons, B.Sc.,Ph.D. W.D. Hay, B.Sc.,D.Phil. A. McKendrick, B.Sc.,Ph.D. C.A. Mackinder, C.Eng.,M.I.E.E.,A.M.B.I.M.,M.I.W.M. G.E. Millard, B.Sc.,A.R.C.S. G.M. Stacey, B.Sc.,Ph.D.,M.B.C.S. P.D. Stephens, M.A. D.B. Taylor, B.Sc.,D.Phil. J.K. Yarwood, M.A.,M.Sc.
Senior Computing Officers	M.D. Brown, M.B.C.S. R.A.F. Chisholm C.C. Davies J.I. Davies, B.Eng K.M. Farvis, B.Sc.,M.A. B.A.C. Gilmore, B.Sc. W.M. Gordon N. Hamilton Smith, B.A. S.T. Hayes, B.A. R.G. Kirsopp, B.Sc.,Ph.D. C. McArthur, B.Sc. R.R. McLeod R.L. Middleton, B.Sc. N.S. Millar, B.Sc. N.K. Mooljee, B.Sc. H.M. Moores, B.Sc. C.H. Nicholas, B.Sc. A.D. Nolan, B.Sc.,M.Sc. D.D.M. Ogilvie, B.Sc. D.O. Sturgess J. Wexler, B.A.

Computing Officers	K.A. Aitchison, B.Sc.
	A.M. Anderson, B.Sc.
	J. Blair Fish, M.A.Ph.D.
	L.A. Brewin, B.Sc.
	J.H. Butler, B.Sc.
	M.J. Cross, B.Sc.,Ph.D.
	W.S. Currie, B.Sc.
	K.D. Dietz, M.A.Sc.,B.A.Sc.
	J.G. Fordyce
	L.C. Griffiths, B.Sc.
	J. Henshall, B.Sc.
	A. Kettler, B.Sc.
	W.A. Laing, B.Sc.,M.Phil.
	D.B. Mercer, B.Sc.
	L. Morris
	B.R.P. Murdoch, B.Sc.
	J.M. Murison, B.Sc.
	J. Phillips, B.Eng.
	A. Shaw, B.Sc.,M.Sc.
	R Soutar, B.Sc.
	D.J.W. Stone, M.Sc.
	B.A. Tate, B.A.,Ph.D.
	W. Watson, B.Sc.,M.Sc.
Assistant Computing Officers	K. Burgoyne, B.Sc.
	G. Howat, B.Sc.,Ph.D.
	C. McCallum, B.Sc.,Ph.D.
Executive Officer	J. Robertson
Reprographic Manager	D.J.L. Stewart-Robinson

Eleventh Annual Report

Introduction

On the Regional Management Committee Professor Lamb replaced Professor Gunn as a representative of the University of Glasgow. On the Edinburgh Computing Committee Mr S.M. Lawrie replaced Mr F. Morley as a representative of the Research Councils; Dr M. Fluendy and Mr J. Tansley were elected by the Users' Committee to serve in place of Mr H. Dewar and Dr J. Read; Dr M. Anderson replaced Mr A. Bijl as the representative of the Faculty of Social Sciences.

The Computer Board decided early in the year that, to repair the shortfall in the Local Edinburgh provision caused by the failure of the Regional ICL 2980 to meet its expected performance, the ICL 2970 already installed in Edinburgh for the Region should become a Local machine from Easter 1978.

The Local and Regional committees debated what system should be adopted for the operation of the Regional ICL 2980. Should it be 2900 EMAS, designed locally by members of ERCC and the Department of Computer Science, or ICL's VME/B? ERCC staff prepared a report to help the committees to reach a conclusion. Before the end of the year the Regional Management Committee had decided to adopt VME/B. Uncertainty in a major area was removed.

The performance of the 2980 in offering a batch service did not improve dramatically but steadily. RJE services can now be maintained and better reliability has been achieved. The mean time between hardware and software crashes continues to lengthen and average serviceability to improve. It looks as if an acceptable service will be within our reach — but it is still not clear when.

At the same time pressure to remove our Regional work from NUMAC was relieved. The deadline for completion of the transfer now stands at 1st January, 1979. ERCC staff are consulting the users and gradually transferring their work to the 2980. Alternatively, continued access to NUMAC is being negotiated for users whose work is specifically suited to the facilities of that centre.

We were advised that the Computer Board had scheduled replacement of our Local System 4s for 1980/81. The current cost of computers allows groups of users to contemplate having a machine dedicated to their own particular needs. Suggestions came from the Computer Board and from our own user community that this new possibility should be kept in mind in drawing up a strategy for the replacement of the System 4s. Members of the Edinburgh Computing Committee visited the United States to examine and explore the possibilities of

distributed computing. The Edinburgh Computing Committee pledged its moral and financial support to a proposal by the Department of Computer Science to acquire its own computer for teaching its undergraduate students. It saw this proposal as a pilot project in the distribution of computing power, and it considered the Department of Computer Science as appropriate to carry out such a project.

It remains the Committee's clear policy that there should continue to be computing facilities serving the whole community, housed and managed centrally; but it foresees that before 1980/81 half of the University's capital expenditure on computing equipment could well be on smaller computers in a distributed network. There will, therefore, need to be greater co-ordination between ERCC and Faculties on the planning of computing. The Computing Equipment Panel will need to expand its membership and remit to perform that function.

Financially the ERCC shares the fate of the universities. Staffing levels are kept under review and the filling of vacancies is scrutinized. Earnings from outside sources have helped to keep the finances in balance. The major uncertainty is the planned redistribution of responsibility between the Computer Board and the UGC for the funding of computer centres. What effect will it have on the Regional Computing Organisation?

Regional Services

The performance of the Regional 2980 has continued to be a source of concern during the year. Hardware reliability has been poor, and has been aggravated by apparently inadequate facilities for fault diagnosis. A great deal of work has been put in both by Regional staff and by members of the ICL project team, but the returns have been disappointingly small in relation to the amount of effort expended.

Early in 1978 the most serious communications faults were at last identified and corrected and communications to RJE terminals became a reasonably reliable process. The overheads are still high, however, and the general facilities available do not match those to which users are accustomed on other systems. Fault finding is very difficult and the absence of any manuals describing the structure and principles of operation of the software is a great handicap to understanding. A proper connection to the Regional network is urgently required. This involves the installation of node software in the 7905 front-end-processor, and awaits a software component being produced in Glasgow for both the 2980 and the 2976.

With the introduction of release 5X23 of VME/B several aspects of the systems software improved markedly. Even so the overall reliability, operability and manageability of the system left a good deal to be desired and in May 1978 the Regional Management Committee reviewed the suitability of VME/B for the type of Regional service required from the 2980. The alternative was EMAS, the development of which had been making great strides on the 2970.

The decision eventually made was in favour of VME/B "for the foreseeable future", though opinion in the Region was sharply divided. That decision cleared the air, but the problems of providing a high quality service remain. Each successive release of VME/B improves the system further, and there is evidence that ICL plan to correct most of the present deficiencies. As forecast in last year's report, however, this will be a very lengthy process. For the 2980 service, the worst problems at present concern communications and spooling, and no significant improvement in these can be expected until 1980. Even then support for communications networks to international standards will still be lacking.

In these circumstances, the level of usage remained static. A fall in the use made by users in Glasgow as their 2976 came into operation towards the end of the year was balanced by an increase in Strathclyde and Edinburgh, particularly as more software packages became available. The range of packages expected with VME/B is probably the best argument for the use of that system on the 2980. In particular, the database package IDMS is likely to be of increasing interest.

The 2970 was handed over to the Local services of ERCC at Easter 1978 and is intended to be used to supplement the EMAS service provided on the two 4-75s. During the autumn of 1977 the machine was used mainly for the development of EMAS, by Glasgow to prepare for their 2976, and for the development of the Edinburgh compilers for IMP, FORTRAN and ALGOL for both VME/B and VME/K.

Regional Communications

Regional communications during the year have been mainly concerned with attempts to improve access to the 2980 and in further consolidation of the Regional network. Increased traffic showed up a number of unsuspected problems and highlighted the deficiencies of some of the protocols inherited from the past. The NSI protocol developed by the Region has however shown its virtues and is gradually superseding the rest. The growth of the X25 inter-

national standards has been closely followed, and their similarity to NSI suggests that eventual conversion to them should not present great difficulty. The Computer Board Network Unit has been of particular value in focussing discussions on network standards. Its projected closure in July, 1978 was viewed with concern, and representations were made to the Computer Board.

Further batches of high-speed communications hardware for the Modular One nodes in the Region have been produced. These mostly support the international HDLC standards and will facilitate moves to a X25 network in due course.

Regional Service at NUMAC

The Region submitted a substantial workload to the IBM 370/168 and 360/65 systems at Newcastle University throughout the year. This work benefited from a generally stable service, which underwent no major system change. In particular, the introduction of a newer version of OS, known as MVS, was deferred until early 1979. This stability has also been an important factor in slowing the move away from NUMAC by our users. At first sight, there would appear to have been little decline in the University workload during the year. However, summary figures are distorted by the work of theoretical chemists using the ATMOL package and, when this usage is excluded, a steady decline during the year is apparent. Most of this decline has been in the running of users' own programs, rather than in a reduced use of packages, a situation which can be expected to change as the availability and efficiency of packages on the 2980 improve. Those users who have moved their working programs elsewhere would appear usually to have chosen EMAS. The Research Councils, for whom guaranteed use of NUMAC has been extended to the end of 1979, have continued to use NUMAC at the sane lebel as in the past, increases in their workload being more evident on EMAS.

EMAS

As we reported last year the EMAS service provided by the twin System 4/75 installation has remained heavily overloaded. Appendix A(iv) summarises the position and the small increase, circ. 25% in the number of interactive sessions, underlines the saturation which we experience. We have continued to offer a service on alternate Saturdays and now also offer a service on alternate Sunday evenings following preventative maintenance.

Hardware reliability has remained reasonable with a satisfaction factor of 98.6% and a mean time between failures of 76 hours. The mean time between any failure has however remained at 30 hours and, as the overall complexity of the equipment increases, this figure is becoming difficult to increase. The only hardware upgrade to the System-4's during the year was the addition of 1/8Mbyte of core store, making both machines of equal size, 1Mbyte, this being the physical limit.

The major event during the year has been the replacement of the CDC fixed-disk filestore. These devices were formally withdrawn from service on 1 August 1978, although the new equipment had taken over the filestore by June. One of the fixed disks has been offered to and accepted by the Royal Scottish Museum and will, in due course, become part of a major exhibit of computer technology. Delivery of the new equipment started in early 1978 and sufficient equipment had been delivered by late March to assemble a complete system. The disk subsystem comprises nine CDC 300 Mbyte drives controlled by three controllers, and provides an increase in file space of about 50% over the old filestore. The implementation of the filestore is effectively transparent to the EMAS software running in the System 4/75's, and the question of the provision of additional features has not yet been debated.

We reported last year that an EMAS implementation had run on 2900 series and was supported by an ERCC project team. As part of the agreement over compensation for the failure of the 2980 to achieve the level of performance stipulated in the contract with ICL, the 2970 was offered to Edinburgh and formally became a local machine in early 1978.

The onus was placed on the University by the Computer Board to achieve the desired level of service. The obvious decision was taken locally, of running EMAS on the machine. The resultant service was formally opened on the 2nd of October although service had been offered to system staff and selected users since early 1978.

The hardware reliability of the 2970 has not yet equalled that of the System 4's and, at about 35 hours between failures, is just adequate to support a user service.

The present configuration of the 2970 is deficient in both main memory (1 Mbyte) and in the file store (400 Mbyte) and proposals are currently before the Computer Board to rectify this. These proposals are presented as the start of a programme to replace the twin 4/75 installation; the second phase of that programme, scheduled for 1980/81, calls for a replacement for the 2970 processor which would allow the release of the first 4/75.

Although reliable information is difficult to obtain, there are indications that our present ability to support circ. 100 simultaneous users needs to expand to a capability for 150-200 users if we are to satisfy existing demands. Growth beyond this requirement is, of course, inevitable although some of it will be met by the increasing number of substantial machines which are being placed in user departments. In recognition of this trend, the Edinburgh Computing Committee strengthened the membership and remit of its Committee for Distributed Computing, specifically to include co-ordination and control of developments.

Local Communications

Again the year has been one of consolidation and rationalisation. The HDLC connections to the Regional Network have become available and are now in use on several links. Reliable communications to V35 standards are not yet available in the absence of adequate test and diagnostic facilities. The 48K baud links to the central area of the University now support three Terminal Control Processors (TCP), all with slow line printers, and the NSI workstation at Buccleuch Place Lane. Plans are in hand to reroute the BPL connection to the Appleton Tower when the accommodation changes (described elsewhere) are completed. These moves continue the trend towards decreased dependence upon Post Office services, the charge for which is widely forecast to increase very substantially in 1979.

The TCP in the Department of Chemistry referred to in last year's report was successfully installed in early 1978 and funds and equipment have now been allocated to the Department of Forestry and Natural Resources and to the Geography Department to install TCPs in early 1979. These authorisations, taken together with the Computer Board's 50% funding of a single additional TCP within the ERCC, bring the total number of TCPs to twelve and underline the Computer Board's diminishing support for the utilisation, as opposed to the provision, of computing services within a university.

A start has now been made on a replacement programme for the original 100 terminals provided by the Computer Board, and the Board has allocated £10,000 for 1977/78 provided the University spend a similar amount. The actual number of terminals is now well in excess of 300 and the University and Research Council expenditure is at least five times that envisaged by the Board.

A visit to the USA by members of the Edinburgh Computing Committee led to the establishment of a project to evaluate suitable high-speed network architectures (> 1000K baud compared with < =48K baud from the Post Office). Such networks are seen as central to the continuing distribution of computing in the University environment. The project-team has as its remit to implement a pilot network, if its evaluation produces a positive proposal. Funds have provisionally been allocated for such a network.

The Network Monitor mentioned last year has now been re-engineered in a portable form based on an LSI-11. Three units have been commissioned, two under contract to the SRC for use on their interactive network and the third for the RCO.

System 10

As noted in last year's Report, the contract between the University and the SRC became effective in December 1976. The first biennial review thus became due in 1978 to take effect formally from December 1978. The review was conducted earlier than was strictly necessary to enable future planning to coincide with the University financial year. The contract has been extended to December 1982.

In parallel with the review of the contract, the Interactive Computing Facilities Committee of the SRC has started to review the ongoing development of the network based on the two System-10s at Edinburgh and Manchester and on its growing number of multi-user minis (MUM), the latter being not yet fully connected to the network. The outcome of this review will clearly be of great importance to both the installation and to the users in the Edinburgh area and both groups are actively contributing to the review process.

The hardware upgrades noted in the last report, namely additional disk storage and a fast plotter, have now been installed and the plotter in particular is contributing to advanced work on the design of circuits. There is still considerable pressure on both the file storage and the main memory of the machine and upgrading must be considered.

The major event of the year has been the relocation of the installation. Agreement was reached with the SRC in early 1978 for plans to relocate the machine in an expanded and refurbished area directly above the System 4/75 machine room and also to undertake a major rationalisation of the communication facilities. Funding for this operation was largely met by the SRC under an arrangement which required the University to recognise this contribution over a period of years when establishing the rentals for the accommodation. Work

started on a fourteen-week programme in March 1978 and was substantially completed before the middle of July. The machine itself was moved over a weekend in late August and was successfully recommissioned during the following week. The new accommodation represents a considerable improvement in operational environment, and together with adjoining accommodation for terminals provides a suite which is both self-contained and capable of absorbing reasonable expansion over the coming years. The relocation of the machine provided an opportunity to bring its communications arrangements into line with ERCC practice.

During the year there has been considerable growth in both the number of users and in the geographical spread of the user population. Both trends have contributed to increased demands on the user-support function, and the population is now close to the planned total of 250 users. As a consequence of this growth, an increase of one staff member has been authorised by the SRC and this post has now been filled.

Data Capture

As in previous years, the Centre has provided comprehensive data-capture facilities, primarily based on its CMC Key-to-Disk system. This reliable installation was upgraded early in 1978 when a change in leasing arrangements made possible the attachment of a larger disk, thus doubling the storage capacity at negligible change in cost. The main benefit of this change has been to make the system more manageable and flexible, and so our staff can be more responsive to users' wishes.

Most magnetic tapes created on the Key-to-Disk system are passed to the special services PDP 11/40 in Buccleuch Place Lane whence data can be transferred directly to the filestores on any of the mainframes. This is one of the functions of the DEIMOS operating system which provides simultaneous RJE connections to EMAS, the 2980, and to NUMAC, and connections to other external services when required. The range of peripherals on the system has now been extended to include paper-tape and mark-sense-card reading, and a graph-plotter.

Usage

Statistics of usage are given in Appendices A and B.

Accommodation

Information Services staff moved to their new accommodation at the North East corner of George Square just before Christmas, 1977. After over a decade in Alison House, the Centre now occupies renovated accommodation which provides an excellent focus for our activities in the central area. The move to George Square benefits users in that the new accommodation is closer to most departments, access to it is easier and the user facilities are much more conveniently laid out. The other major stage will be the integration of the Buccleuch Place Lane services into the basement of the Appleton Tower. Funds for this work have now been approved by the University and the construction of a Computer Hall and associated facilities there is expected to start early in 1979.

Staffing and Organisation

The major developments in Information Services have been in the database area, where staff are involved in both development work for the FORTRAN Interface Sub-system (FISS) for IDMS and in applications of the package to user projects. Additional staff are being recruited to fulfil the requirements of the ICL contract for FISS. Two other new appointments are indicative of increased commitments; first of an Assistant Training Officer, which should enable us to broaden the scope of our courses for users and staff alike, and second of a Computing Assistant to work on the move of users off Newcastle. This latter task is being controlled by members of the Advisory Service, where there have been two further changes in personnel during the year, both without diminution in the quality and extent of the advice offered by the Service.

Appendix A(i)

Utilisation of NUMAC OS during 1977-78
by participating Institutions

Institution	No of Jobs	Proportion of Total Jobs	Notional Costs	Proportion of Total Job Costs	File Storage Costs	Proportion of Total File Costs	Combined Costs	Proportion of Total Combined Costs
Edinburgh University	37304	18.67	£143732.90	21.51	£27411.04	33.56	£171143.94	22.82
Glasgow University	75632	37.85	£256855.89	38.43	£28287.72	34.64	£285143.61	38.02
Strathclyde University	21136	10.58	£169788.70	25.41	£ 6088.27	7.45	£175876.97	23.45
Other Universities	114	0.06	£ 52.85	.01	£ 147.72	0.18	£ 200.57	0.03
Research Councils	35418	17.73	£ 49948.22	7.47	£ 6751.56	8.27	£ 56699.78	7.56
Treasury Supported*	8524	4.27	£ 12221.26	1.83	£ 3811.05	4.67	£ 16032.31	2.14
Commercial Users	121	0.06	£ 568.04	0.09	£ 5.33	0.01	£ 573.37	0.08
ERCC Regional Use	7901	3.95	£ 10772.50	1.61	£ 5608.63	6.87	£ 16381.13	2.18
Overheads	13653	6.83	£ 24340.79	3.64	£ 3555.90	4.35	£ 27896.69	3.72
TOTALS	199803	100.00	£668281.15	100.00	£81667.22	100.00	£749948.37	100.00

* Includes Edinburgh University Data Processing Office

NB Jobs includes file transactions

NB Newcastle not included

Appendix A(ii)

Utilisation of NUMAC OS in 1977-78
by University of Edinburgh and Research Councils

Faculty or Sub-Faculty or Research Council	Computer Transactions (exc. file storage)	Notional Cost	Proportion of Total Cost
Arts	20	1932.60	.68
Divinity	---	---	---
Law	105	162.56	.06
Social Sciences	13005	60888.76	21.44
Music	33	21.92	.01
Medicine	3266	6422.30	2.26
Dentistry	92	207.75	.07
Veterinary Medicine	104	403.85	.14
Physical Sciences	8269	72668.35	25.58
Engineering	1473	6401.36	2.25
Biological Sciences	2490	5961.17	2.10
Miscellaneous	2734	4369.77	1.54
Data Processing Office	2006	5364.70	1.89
Computing Service (Local)	8644	18261.12	6.43
Computing Service (Reg.)	21554	44277.92	15.59
ARC	30915	37097.41	13.06
MRC	1933	6425.01	2.26
NERC	2570	13177.36	4.64
	99213	284043.91	100.00
Other Universities	14844	61077.10	
Treasury Funded Users*	1479	10667.61	
Commercial Users	91	573.37	
	115627	356361.99	

*excludes Edinburgh University Data Processing Office

Appendix A(iii)

Breakdown of Usage of NUMAC OS Service

University of Edinburgh

Packages				Languages			
Name	Calls/week	% resource used	Average cost/ call (£)	Name	Calls/week	% resource used	Average cost/ call (£)
1. SPSS	189	26.90	4.62	1. FORTRAN (Edinburgh)	112	5.64	1.63
2. SORT	68	0.80	0.38	2. WATBOL	81	0.46	0.18
3. ATMOL	68	33.45	18.85	3. IMP	72	7.39	3.34
4. GENSTAT	45	2.22	1.61	4. FORTRAN (IBM level G)	65	9.49	4.70
5. ICES	18	4.14	7.52	5. FORTRAN (IBM level H)	3	0.33	3.83
6. TRIP	8	0.69	2.88				
7. PURGE	7	0.16	0.72				
8. LINEEDIT	6	0.05	0.30				
9. ESP74	4	0.11	0.79				
10. CAMAP	4	0.46	4.15				
11. COAEDEX	3	0.03	0.36				

Research Councils

Packages				Languages			
Name	Calls/week	% resource used	Average cost/ call (£)	Name	Calls/week	% resource used	Average cost/ call (£)
1. GENSTAT	215	26.80	1.36	1. FORTRAN (Edinburgh)	132	12.75	1.05
2. SPSS	26	2.42	1.00	2. FORTRAN (IBM level G)	129	28.29	2.39
3. GLIM	13	0.52	0.43	3. IMP	65	6.53	1.09
4. SORT	10	0.54	0.59	4. FORTRAN (IBM level H)	14	9.12	6.94
5. RGSP	9	1.43	1.76	5. COBOL	4	0.12	0.34
6. COMPREG	5	0.72	1.52				
7. EDEX	5	0.07	0.18				
8. CAMAP	3	0.49	1.64				
9. LINEEDIT	3	0.03	0.13				
10. BMD	3	0.09	0.45				

Notes: 1. Other package and language usage by either the University or Research Councils is insignificant. The total usage comprises

	Packages	Languages	Utilities, etc.
Edinburgh University	69.0%	22.9%	8.1%
Research Councils	33.1%	56.9%	10.0%

2. The figures are derived from the period March to May, 1978.

Appendix A(iv)

Analysis of Utilisation of 4-75 in 1977-78

Faculty or Sub-Faculty or Research Council	Cost	Proportion of Total Cost
	(£)	(%)
Arts	15830.89	.87
Divinity	2114.53	.12
Law	2.00	—
Social Sciences	89811.25	4.94
Music	54.96	—
Medicine	40391.12	2.22
Dentistry	7798.24	.43
Veterinary Medicine	1280.34	.07
Physical Sciences	877675.46	48.25
Engineering	69914.88	3.84
Biological Sciences	119593.85	6.57
Miscellaneous	131570.35	7.23
Computing Service (Local)	235604.61	12.95
Computing Service (Reg.)	32110.44	1.77
ARC	104612.14	5.75
MRC	6031.69	.33
NERC	48662.55	2.68
Other Universities	1040.36	.06
Other Treasury Funded	28430.44	1.56
Commercial Users	6591.03	.36
	1819121.13	100.00

Appendix A(v)

EMAS Service – Facts and Figures 1977-78

General	Average weekly interactive service	100 hrs
	Total number of accredited users	1,500
	Total number of student users	500
	Average weekly number of active users	900
	Average weekly notional income	£30,000
Performance	Average weekly system uptime percentage	98.7%
	Average weekly satisfaction percentage	98.6%
	Mean Time between failures (Hardware; 4/75s)	76 hrs
	Mean Time between failures (Software)	4,000 hrs
	Mean Time between any failure	30 hrs
Interactive Service	Average weekly number of console sessions	8,000
	Length of average console session	25 mins
	Average weekly interactive console hours used	3,333
	Average CPU time used per session (including paging)	75 secs
	Average CPU/CONNECT time ratio	3.0 sec/min
Background Service	Average weekly number of batch jobs	900
	Average CPU time used per job	250 secs
On-Line File System*	Total number of on-line user files	25,000
	Total amount of on-line user material	1,000 Mbyte
	Average number of files covered by backup	7,500
	Average file size	40,000 bytes
Archive Store	Total number of files on archive	150,000
	Total amount of archive material	9,000 Mbyte
	Average file size	60,000 bytes
	Number of active magnetic tapes	480
	Average restoration time	10 mins
	Total size of on-line archive index	7.2 Mbyte

The file system consists of 8 units, each of 200 Mbyte effective capacity. On each unit 25% is required for the spool system and for temporary user files. The archive cycle attempts to balance the user permanent file space at about 1000 Mbyte to permit some resilience and allow adequate weekly growth.

Appendix B

List of User Departments (1977-78)
(i) University of Edinburgh

Accounting and Business Method
Agriculture, School of
Anaesthetics
Animal Genetics
Animal Health
Archaeology
Architecture
Architecture Research Unit
Architecture Research Unit
Astronomy
Bacteriology
Biochemistry
Botany
Business Studies
Chemical Engineering
Chemistry
Child Life and Health
Civil Engineering & Building Science
Clinical Chemistry
Classical Archaeology
Computer Science
Conservative Dentistry
Criminal Law
Criminology
Data Processing Office
Dental Surgery
Dictionary of the Older Scottish Tongue
Economic History
Economics
Educational Sciences, The Centre for Research in
Educational Studies
Electrical Engineering
English Language
Fire Safety Engineering
Forestry & Natural Resources
French
General Practice
Geography
Geology
Geophysics
Geriatric Medicine
History
Human Genetics
Linguistics
Mathematics
Mechanical Engineering
Medical Computing & Statistics Group
Medical Faculty
Medical Physics
Medical Physics (Western General Hospital)
Medicine
Medicine (Western General Hospital)
Meteorology
Molecular Biology
Music
Neurology
New Testament Language Literature and Theology
Nursing Studies
Oral Medicine and Pathology
Otolaryngology
Pathology
Pharmacology
Physical Education
Physics
Physiology
Politics
Pollock Halls
Preventive Dentistry
Program Library Unit
Psychiatry
Psychology
Public Law

Radiotherapy
Rehabilitation Medicine
Respiratory Diseases
Restorative Dentistry
Science Studies Unit
Social Administration
Social Anthropology
Social Medicine
Social Sciences, Faculty Office
Sociology
Statistics
Surgery
Therapeutics
Tropical Animal Health
University Library
Urban Design and Regional Planning
Veterinary Computing Group
Veterinary Medicine
Veterinary Pathology
Veterinary Pharmacology
Veterinary Physiology
Zoology

(ii) Research Council Institutes and Units

ARC	Animal Breeding Research Organisation
ARC	Animal Diseases Research Association
ARC	Unit of Animal Genetics
ARC	Hannah Research Institute
ARC	Hill Farming Research Organisation
ARC	Macaulay Institute for Soil Research
ARC	Poultry Research Centre
ARC	Rothamsted Experimental Station
ARC	Scottish Horticultural Research Institute
ARC	Scottish Institute of Agricultural Engineering
ARC	Unit of Statistics
ARC	Scottish Plant Breeding Station
MRC	Unit for Research in the Epidemiology of Psychiatric Illness
MRC	Brain Metabolism Research Unit
MRC	Clinical and Population Cytogenetics Research Unit
MRC	Mammalian Genome Unit
MRC	Medical Sociology Unit Centre for Social Studies
MRC	Psychology (Warwick)
MRC	Reproductive Biology Research Unit
MRC	Radioimmunoassay
NERC	Institute of Marine Environmental Research
NERC	Institute of Geological Sciences
NERC	British Antarctic Survey Unit
NERC	Institute of Terrestrial Ecology

(iii) Other Universities

Cardiff
Dundee
Glasgow
Heriot-Watt
Newcastle
Nottingham
Open University
Reading
Stirling
Strathclyde

Appendix C

Financial Statement for the year 1 August 1977 to 31 July 1978

Income

	£	£	£
Computer Board direct grants			
Recurrent grants: Local	167 277		
Regional	490 110		
		657 387	
Earmarked capital grant: Regional		24 120	
			681 507
Fully charged-out services			
Research Councils		228 745	
Commercial and Treasury supported		90 838	
Edinburgh and other universities		1 688	
Edinburgh University DP office		5 706	
ICL software contracts		68 340	
Access to 2900 computers		22 747	
			418 064
SRC contract			
SRC net payments		114 136	
Sale of computer time		10 878	
			125 014
Third and fourth shift charges			8 179
Recoveries			85 751
Administrative services			125 302
Edinburgh University contribution			567 058
UGC grant			43 000
Balances b/fwd from 1976/77			
Local		73 659	
Regional		67 912	
SRC		22 943	
			164 514
			£2 218 389

Expenditure

	£	£
Staff Costs		
Academically related	468 515	
Other	317 221	
Casual	43 023	
		828 759
Materials and Services		
Travel and subsistence	20 804	
Computer materials	119 544	
External service charges and rentals	212 452	
Mainframe maintenance	303 811	
Telecommunications	110 719	
Engineering development	27 815	
Information and training	27 222	
General expenses	104 629	
	926 996	
less Stocks-in-hand	10 414	
		916 582
Overheads: Edinburgh University services		
ERCC	82 622	
SRC	22 500	
		105 122
Payment of Glasgow Data Transfer service losses		16 006
Transfer to Capital Reserve		65 000
Bad debts written off		2 847
Balances carried forward		
Local	149 574	
Regional	122 350	
Overpayment: SRC	1 911	
Computer Board	10 238	
		284 073
		£2 218 389